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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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EXAMINER

LEE, RIP A

| ART UNIT | PAPER NUMBER |
|----------|--------------|
| 1713 | 5 |

DATE MAILED: 04/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|-----------------|-------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/914,305 | DALL'OCCHI ET AL. |
| Examiner | Art Unit | |
| Rip A. Lee | 1713 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on _____.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-27 is/are rejected.
- 7) Claim(s) 1,4,6,8,16-20,22,23 and 27 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) Interview Summary (PTO-413) Paper No(s). _____.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____.

DETAILED ACTION

This office action follows a preliminary amendment filed on August 27, 2001. Original claims 1-4, 6-8, 10, 13, and 15-26 were amended, and new claim 27 was added.

Claim Objections

1. Claims 1, 16, 22 (two occurrences), 24, 25, and 26 are objected to because of the following informalities: The claim indicates that groups *A* and *B* are selected from sulfur, oxygen and CR⁹, with the added proviso that *A* and *B* can not be oxygen or sulfur simultaneously. It is noted that no limitation has been imposed on an embodiment in which both *A* and *B* are CR⁹. The objection lies in the fact that such a species would not be not electronically saturated. Further elucidation or appropriate correction is required.
2. Claim 4 is objected to because of the following informalities: The claim recites “*A* and *B* are sulfur or a CH group, either *A* or *B* being different from CH.” The two limitations are contradictory. Appropriate correction is required.
3. Claim 6 is objected to because of the following informalities: (i) Change “cyclalkyl” in line 18, to “cycloalkyl.” (ii) The condition that “R¹² is different from halogen” is irrelevant because R¹² was never defined as a halogen (see lines 17-18). (iii) In reference to claimed empirical formulae H_jAlR¹²_{3-j} and H_jAl₂R¹²_{6-j}, it is unclear how *j* can be a non-integer number. Appropriate corrections are required.

4. Claim 8 is objected to because of the following informalities: It is uncertain what constitutes a "compatible" anion. As long as charge balance is met, it would appear that any anion is "compatible." Further elaboration or appropriate correction is required.

5. Claim 16 is objected to because of the following informalities: Fulvalene (IV) is shown to have substituents R¹ to R⁵, and the claim recites the groups on page 12, line 15. The substituents should be renumbered since the nomenclature has already been used in a previous claim.

6. Claim 17 is objected to because of the following informalities: Not all quaternary ammonium salts, as recited generically, qualify as protonating agents. Further elaboration or appropriate correction is required.

7. Claims 18, 19, 20, 23, and 27 are objected to because of the following informalities: The compound "copper chloride" should be rewritten "copper (II) chloride" in order to distinguish it from copper (I) chloride.

8. Claim 20 is objected to because of the following informalities: On page 16, line 13, change the phrase "*A* are sulfur or oxygen" to "*A* is sulfur or oxygen."

9. Claim 22 is objected to because of the following informalities: The description of ligand (II) contains no provision for the presence of a double bond in the flanking heterocyclic rings containing *A* and *B*. As such, use of ligand (II) would not yield metallocene (I). Appropriate correction is required.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11. Claim 1 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

For metallocene of structure (I), abbreviated herein as L_2MX_p , where L_2 is the examiner's notation for the claimed π -ligand set, numerous embodiments for group X have been recited. According to the claim, one embodiment of metallocene (I) may contain two OR^{10} groups whereas another embodiment may contain two NR^{10}_2 groups. The claim further states that compound (B) is one that forms an alkyl metallocene cation upon contact with (I). While it is accepted that an alumoxane is capable of performing said transformation, the identity of the other compound (B) which can convert a species such as $L_2M(OR^{10})_2$ or $L_2M(NR^{10}_2)_2$ directly into said alkyl metallocene cation has not been disclosed. Even compounds exemplified in the specifications do not perform this feat.

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite because it contains improper Markush language. According to MPEP 2173.05(h), when materials are so related as to constitute a proper Markush group, they may be recited as, “wherein R is a material selected from the group consisting of A, B, C, and D,” or “wherein R is A, B, C, or D.” In the recitation “one of an alumoxane and a compound,” it is unclear whether the process requires one of each type (*i.e.*, one alumoxane and one compound) or one from the group consisting of alumoxane and compound (*i.e.*, use of either alumoxane or compound alone is acceptable).

14. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim recites “a compound capable of forming an alkyl metallocene cation.” The word “capable” renders uncertainty to whether said transformation actually occurs. If it does not, then it would appear that component (B) is not really necessary. Furthermore, if said event does not occur, it is unlikely that polymerization would take place.

15. Claims 1, 16, 22, 24, and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what is meant by the recitation, “wherein the rings containing A and B have a double bond in the allowed position having an aromatic character.” First, if the proviso that A is S or O and B is CR⁹ is met, there is only one possible position the double bond can occupy. The same applies for the condition where “B is S or O and A is CR⁹.” The claim seems to imply there are various allowed positions. Secondly, the outer rings containing A and B in the free ligands (as per claim 16 and 24) have no aromatic character.

Finally, the double bond may occupy two possible positions when both *A* and *B* are CR⁹ (*vide supra*), in which case, neither of the auxiliary rings possesses aromatic character either.

16. Claims 1 (three occurrences), 16 (five occurrences), 18 (two occurrences), 19 (two occurrences), 20 (two occurrences), 22 (five occurrences) 23 (four occurrences), 25 (three occurrences), 26 (two occurrences), and 27 (two occurrences) are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The generic claim that substituents “optionally contain heteroatoms belonging to groups 13 or 15-17 of the Periodic Table of the Elements” is vague and indefinite because the number and type of heteroatom, and manner in which the heteroatom is incorporated into the overall compound is not disclosed adequately.

To the extent that the actual scope of the claim encompasses all twenty-one of the heteroatoms from groups 13 and 15-17 (particularly In, Tl, Pb, Bi, Te, Po, and At) is dubious at best, and this observation is noted officially in this rejection.

17. Claims 1, 16 (two occurrences), 22 (two occurrences), 25, and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim indicates that the rings formed by R¹ and R², R³ and R⁴, R⁵ and R⁶ can bear “substituents.” This recitation is vague and indefinite because the number, identity, and location of said substituents have not been disclosed adequately.

18. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim recites (i) a compound “capable of forming,” (ii) an acid “able to give a proton,” and (iii) an anion which is “able to be removed.” As pointed out in paragraph 14, terms such as “capable” and “able” render uncertainty to the claim. Either the materials perform the claimed task or they do not.

19. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite due to the limitation “anion Z^- ” There is insufficient antecedent basis for this limitation in the claim.

20. Claims 18, 19, 20, 23, and 27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite because it contains improper Markush language. According to MPEP 2173.05(h), when materials are so related as to constitute a proper Markush group, they may be recited as, “wherein R is a material selected from the group consisting of A, B, C, and D,” or “wherein R is A, B, C, or D.” It is unclear which elements or combination of elements in the recitation “copper chloride, iodine or Mg/Pd” constitutes the coupling agent.

21. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite because it contains improper Markush language (*q.v.*).

22. Claim 25 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim lacks any provisions for the presence of double bonds in the auxiliary heterocyclic rings.

Claim Rejections - 35 USC § 102

23. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

24. Claims 1-7, 10-12, 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by WO98/22486 to Ewen *et al.* and by Ewen *et al.* (*J. Am. Chem. Soc.* 1998).

Both references disclose catalysts derived from isopropylidene (3-alkylcyclopentadienyl) (7-cyclopentadithiophene)zirconium dichloride and MAO. Whereas the journal article cites the *t*-butyl derivative, the patent discloses other alkyl substituted derivatives (page 15). However, these examples are non-limiting (page 15, line 7), and substituents include H, linear or branched C₁-C₂₀ hydrocarbon, C₆-C₂₀ aryl, C₇-C₂₀ arylalkyl, and C₆-C₂₀ alkylaryl radicals, *inter alia* (pages 38-39). The catalyst is used for the polymerization of ethylene (Example 7) and propylene (Example 8 and Table 1). The synthesis of the ligand outlined in Example 6 is identical to that recited in present claims 16 and 17.

25. Claims 22 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by WO98/22486 to Ewen *et al.*

According to claim 1 of Ewen *et al.*, the metallocene contains a metal from groups 3-6 as well as from the actinide and lanthanide series. Specifically, group 4 contains the metals titanium, zirconium, and hafnium. Therefore, isopropylidene (3-alkylcyclopentadienyl) (7-

cyclopentadithiophene)titanium and halfnium dichlorides lie within the purview of the invention, and these compounds satisfy the more limited set of compounds set forth in the present claims. As such, claims 22 and 25 are still anticipated by the prior art.

26. Claims 18 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Kraak *et al.*

The prior art of Kraak *et al.* discloses a method for preparing cyclopentadithiophenes such as the ones claimed in present claim 24 (see page 3381). The synthetic steps outlined in Scheme 1 are identical to that recited in present claim 18. Therefore, these two claims are anticipated by the prior art.

Claim Rejections - 35 USC § 103

27. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

28. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

29. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.* in view of 5,198,401 to Turner *et al.*

The discussion of the disclosures of the prior art of Ewen *et al.* from paragraphs 23 and 24 of this office action is incorporated here by reference. The prior art does not teach the use of a compound of formula D^+E^- , as recited in the present claims. The use of said compounds for the express purpose of generating alkyl metallocene cationic species is well-known in the art. This is an established method for forming an active species without using MAO. By way of example, Turner *et al.* discloses use of the compound dimethylanilinium *tetrakis*(pentafluorophenyl)borate as a co-activator for making an alkyl metallocene cation (Examples). Thus, it would have been obvious to one having ordinary skill in the art to use these well-known compounds for making a cationic active species from metallocenes described in Ewen *et al.*, motivated by a reasonable expectation of success. *In re O'Farrell*, 7 USPQ 2d 1673 (Fed. Cir. 1988).

30. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.* in view of U.S. Patent No. 5,948,873 to Santi *et al.*

All discussions of the disclosures of the prior art of Ewen *et al.* are incorporated here by reference. Ewen *et al.* does not recite a process for the polymerization of ethylene and cyclic olefin monomers. The use of catalysts derived from metallocene/MAO for making ethylene/α-olefin copolymers, ethylene/cyclic olefin copolymers, and ethylene/α-olefin/cyclic olefin copolymers is well established in the art. The patent by Santi *et al.* exemplifies a process for the synthesis of ethylene/propylene/diene terpolymers in which the diene is derived from 5-

ethylidene-2-norbornene (col. 6, line 15 and Tests 1-16). Thus, it would have been obvious to one having ordinary skill in the art to use the catalysts of Ewen *et al.* for preparing polymers containing units derived from 5-ethylidene-2-norbornene, and one with ordinary skill in the art would have expected such a procedure to work. *In re O'Farrell*, 7 USPQ 2d 1673 (Fed. Cir. 1988).

31. Claims 22 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO98/22486 to Ewen *et al.*

According to claim 1 of Ewen *et al.*, the metallocene contains a metal from groups 3-6 as well as from the actinide and lanthanide series. In addition, substituent R on structures (g) and (l) (see page 36) include H, linear or branched C₁-C₂₀ hydrocarbon, C₆-C₂₀ aryl, C₇-C₂₀ arylalkyl, and C₆-C₂₀ alkylaryl radicals, *inter alia* (pages 38-39). The reference does not teach compounds having the exhaustive listing of substituents recited in the present claims, nor does the reference teach a process to make them.

Regarding claim 25, the basic structure and design of the metallocene has already been disclosed in the prior art, and the inventive aspect of the catalyst, particularly the ligand framework, has already been set forth. Since the prior art also discloses structural analogues in which substituents lie along the ligand periphery, it would have been obvious to one having ordinary skill in the art to derive other structural analogues containing different substituents.

With respect to claim 22, Ewen *et al.* discloses only one method of preparation for the metallocenes of the invention. Since the method is general, and since it is used by the inventors to prepare all metallocenes of the invention, it would have been obvious to one having ordinary

skill in the art to use the same synthetic guidelines to prepare the compounds of the present claims, and one would have expected the general scheme to work.

32. Claims 16, 17, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Kraak et al.*

The discussion of the disclosures of the prior art of *Kraak et al.* from paragraph 25 of this office action is incorporated here by reference. The reference does not teach the synthesis of substituted cyclopentadithiophenes. However, it would have been obvious to one having ordinary skill in the art to use the same synthetic protocol for making cyclopentadithiophenes with the claimed hydrocarbon-based substituents because one with skill in the art recognizes that these substituents do not affect the mechanism of a reaction. Therefore, one with skill in the art would expect the general mechanism to work for a series of substituted thiophene precursors.

33. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Kraak et al.* in view of *Elschenbroich et al.*

The claimed process is identical to that disclosed by *Kraak et al.* except for the lithiation step. The reference does not teach the use of tetraethylenediamine (TMEDA) in conjunction with an organolithium. As shown in *Elschenbroich et al.*, it is well known that alkylolithium compounds exist as aggregates. It is also well established that use TMEDA is used to break up these aggregates in order to enhance the rate of alkylolithium mediated metalation reactions (see pages 19-29). Therefore, it would have been obvious to one having ordinary skill in the art to use TMEDA in the lithiation step of *Kraak et al.* as well.

34. The prior art made of record but not relied upon is considered pertinent to the Applicant's disclosure. The following reference relates to the synthesis of cyclopentadithiophenes.

Iyoda *et al.*, Tetrahedron Letters, 1997, 38(26), 4581.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rip A. Lee whose telephone number is (703)306-0094. The examiner can be reached on Monday through Friday from 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached at (703)308-2450. The fax phone number for the organization where this application or proceeding is assigned is (703)746-7064. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.

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March 28, 2002


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